

congenital disability, trauma, or any other catastrophe. In one case the emphasis may be on the shape of tissue, in the other upon the subjective experience of the particular patient; on form and contour, or feelings and confidence; but, fundamentally, both these aspects are part of the whole human being and deserve the shared and balanced attention of experts in the respective fields.

### Summary

A plea is made for more active co-operation between plastic surgeon and psychiatrist. A provisional and basic classification of mental reactions to disfigurement is provided. An attempt is made to outline the groups which are particularly amenable to combined plastic and psychiatric treatment. While the traditionally cautious or conservative approach to the problem has been avoided, we emphasize the dangers that can follow imperfect or inadequate selection of psychiatric patients for plastic surgery.

## + PLANT DERMATITIS\* ↓

BY

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Despite the increasing industrialization of Britain, plants and their products remain among the more frequent causes of dermatitis. *Primula obconica* was introduced to cultivation in 1882, and its capacity to induce dermatitis was very soon recognized. During the next few years a flood of articles and letters convicted this attractive plant of many crimes, including murder (Brown, 1906), and it has largely retained its villainous reputation. This notoriety has had interesting consequences. The fact that many other plants, common in Europe in the wild or in cultivation, often cause dermatitis tends to be ignored by patient and doctor alike, whilst the primula, even when innocent, is banished without trial. The near relatives of *P. obconica*, notably the popular *P. malacoides*, are often forced to share its banishment, although the majority appear to be incapable of causing dermatitis. On the credit side, *P. obconica* was used for many of the earlier investigations which laid the foundations of our knowledge of the mechanisms of contact sensitization.

Fashions in horticulture change. The years since the second world war have seen a steady growth in the popularity of the "house plants," plants displaying a degree of tolerance of the half shade, smoky atmosphere, and inconstant temperature of the average living-room. The small greenhouse, too, is increasing rapidly in numbers and providing accommodation for hundreds of less tolerant species. There are therefore few persons in this country, whether town or country dwellers, who do not regularly or occasionally come into contact with many different plants. The countryman and the gardener face, in addition, frequent exposure to "weeds." The non-botanist is often surprised to learn that the wild flora of Britain is constantly changing. Plants accidentally introduced become established and gradually extend their range. Among recent arrivals which are contriving successfully to spread are certain species which enjoy

an unpleasant reputation as causes of dermatitis in their North American homeland.

This article attempts to provide an account of the problem of plant dermatitis as it exists in Britain at the present time. New and potential hazards are described, and the value of certain elementary botanical knowledge in predicting the presence of the capacity to produce dermatitis is emphasized. Woods, many of which can cause dermatitis in the carpenter, are not considered here.

### Varieties of Plant Dermatitis

**Primary Irritant Dermatitis.**—The plant may exert a directly injurious action on the skin. The stinging hairs of the nettle offer an obvious example. Some of the spurges (*Euphorbia* sp.) may irritate sensitive skin, and children chewing the leaves or stems of certain buttercups may complain of burning and blistering. In general, however, primary irritants among the British flora are of little clinical significance and will not be further considered.

**Sensitization Dermatitis.**—Most cases of plant dermatitis are the result of an allergic sensitivity. Such sensitivity is not inborn but is dependent on immunological changes induced by previous contact with the same plant or sometimes with a closely related species. Certain plants can be regarded as potent sensitizers in that brief contact may induce sensitivity in a considerable proportion of those exposed. Most of the plants with which we are here concerned have a relatively low sensitizing capacity in that prolonged or frequent contact induces sensitivity in only a very few of those exposed. Sensitivity may develop within seven to ten days of the first contact or only after many years of exposure, and no plant can be exonerated from responsibility for dermatitis solely on the grounds that the patient has long handled it with impunity.

**Phytophotodermatitis.**—Certain plants induce a distinctive reaction when skin against which their leaves or stems are crushed is subsequently exposed to light. All those exposed in sufficient degree are susceptible, as direct photosensitization and not an allergic mechanism is involved.

### The Antigenic Substances

In only a few instances has the chemical nature of the antigenic substances in plants been established. The most fully investigated are those of poison ivy (*Rhus radicans*), a serious cause of dermatitis in the United States and Canada, fortunately unlikely to be encountered in Britain outside botanical gardens. Poison ivy contains four antigenic components (Kligman, 1958), all of which are catechols. The antigenic substances in this plant and in related species are phenols, catechols, or resorcinols with a 15 carbon atom chain, usually unsaturated, in a position para to one of the hydroxyl groups. The antigenic substance of *P. obconica* has been isolated from the glandular hairs which clothe leaves and stems and has been named "primin." The formula of primin has been established as  $C_{14}H_{18}O_3$ , but its precise chemical structure is uncertain. Primin, like the hydroxyphenols of the poison ivy family, is a constituent of the oleoresin fraction of the plant. The antigen in some important members of the daisy family (Compositae) has also been identified with this fraction (Shelmire, 1939).

The oleoresin fraction consists of a mixture of substances, including essential oils, terpenes, resins,

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phenols, and camphors. These substances are regarded by botanists as secondary products in that they appear not to enter into the active metabolism of the plant. Some probably represent excretory metabolites, but the function of many is unknown. They are often secreted and stored in special cells or cavities. In some species they are present in abundance only when growth is vigorous. Their distribution throughout the plant also shows species differences. Of particular significance is the presence of oleoresins in some pollens which may be borne by the wind. Although there is suggestive evidence that the sensitizing substance of many plants is contained in the oleoresin fraction, it is not intended to imply that this is necessarily true of all plant antigens causing dermatitis. Some few are water-soluble and may be glucosides, and the nature of others is quite unknown.

### Photosensitizing Substances

Phytophotodermatitis is caused, at least in some cases, by furocoumarins, which potentiate the action of ultra-violet light on the skin. These substances have not yet been conclusively incriminated as the sole cause of this reaction, but they may prove to be so as they are known to occur in most of the species concerned and their presence in the remainder has not been investigated.

### Some Botanical Considerations

The classification of plants into orders, families, tribes, genera, and species is based very largely on morphological characters, supplemented in some cases by chromosome studies. The capacity to induce allergic dermatitis or a photosensitization reaction depends on biochemical characters. Very little systematic research on the correlation between morphological and biochemical features has yet been carried out. When the plants reliably reported as causing dermatitis are classified botanically they are seen to be restricted to relatively few families, and often to only a small number of genera in each. If a patient sensitive to one species be patch-tested with related species or genera some indication is obtained of the distribution of the same or chemically related antigenic substances. A few such experiments have been reported (Lopes, 1955; Mackoff and Dahl, 1951; Howell, 1959), and investigations of this type are in progress in Cambridge.

By summarizing the evidence drawn from the systematic classification of incriminated species and from cross-sensitivity studies, certain tentative conclusions of practical importance may be drawn. In the daisy family (Compositae) those plants causing sensitization dermatitis belong, with the exception of two isolated case reports, to the Tubuliflorae, a morphological feature of which is the frequent presence of resin canals, which are usually absent in the other great division of the Compositae, the Liguliflorae. The Tubuliflorae are usually divided into eleven tribes: almost all of the common sensitizing species belong to the related tribes Heliantheae, Helenieae, and Anthemideae, two to the Cynareae, and one each, both very rarely reported, to the Eupatorieae and the Astereae. A patient sensitized to one of the Compositae is usually also sensitive to other species in the same genus and frequently to other genera in the same tribe.

The situation in the primrose family (Primulaceae) is strikingly different. Although this family contains some 25 genera and about 550 species, only one species,

*P. obconica*, is a common cause of dermatitis. *P. sinensis* is occasionally incriminated and *P. farinosa* very rarely. With few exceptions the patient sensitive to *P. obconica* does not react to other species. This subject is not further elaborated here, as these examples will suffice to illustrate the type of evidence on which the recommendations given below are based.

### The Common Causes of Plant Dermatitis in Britain

Some of the commoner causes of sensitization dermatitis among housewives and amateur gardeners are listed in Table I. The plants in Table II rarely cause trouble to those whose contact with them is brief and occasional but are incriminated as causing dermatitis in those who handle them regularly as market gardeners, nurserymen, foresters, bulb-growers, or in preparing food for canning or packing. Obviously such persons are also no less susceptible than the housewife to plants in Table I.

The plants in Table III cause phytophotodermatitis in all exposed under the appropriate conditions. Children, campers, and bathers are most at risk except in the case of the parsnip.

TABLE I

Botanical Name	English Name	Family	
<i>Primula obconica</i>		Primulaceae	Common house or greenhouse plant
<i>Chrysanthemum</i>	Chrysanthemum	Compositae	Common house, garden, and greenhouse plants
<i>X morifolium</i>	Shasta daisy	"	Popular cut flower
<i>Chrysanthemum</i> <sup>1</sup>		"	
<i>maximum</i>		"	
<i>C. coccineum</i> <sup>2</sup>	Pyrethrum	"	Wild and garden flower
<i>C. leucanthemum</i>	Marguerite	"	"
<i>C. parthenium</i>	Feverfew	"	"
<i>Tanacetum</i>	Tansy	"	Wild, widely distributed
<i>vulgare</i> <sup>3</sup>		"	
<i>Gaillardia</i> sp. <sup>4</sup>	Gaillardia	"	Border flower
<i>Helium</i> sp. <sup>5</sup>		"	Common garden plants
<i>Pelargonium</i>	Geranium	Geraniaceae	Common house, greenhouse, and garden plant
<i>Hedera helix</i> <sup>6,7</sup>	Ivy	Araliaceae	Wild and garden climber. House plant
<i>Lycopersicum</i>	Tomato	Solanaceae	Vegetable. Only the leaves and stems cause dermatitis
<i>esculentum</i>		"	
<i>Philodendron</i>		Araceae	House plant
<i>scandens</i> <sup>8,9</sup>		"	
<i>Allium sativum</i>	Garlic	Liliaceae	The "bulb" may cause dermatitis in those preparing it for the table
<i>Allium cepa</i>	Onion	"	"
<i>Ambrosia</i>	American ragweed	Compositae	Important causes of dermatitis in North America. Adventives in Britain
<i>artemisiifolia</i> <sup>10</sup>		"	
<i>Iva xanthifolia</i>		"	
<i>Xanthium</i> sp.		"	

<sup>1</sup> Nightingale (1931). <sup>2</sup> Sequeira (1936). <sup>3</sup> Sulzberger and Wise (1930). <sup>4</sup> Zschunke (1955). <sup>5</sup> Balyeat et al. (1932). <sup>6</sup> Goldman et al. (1956). <sup>7</sup> Dorsey (1957). <sup>8</sup> Harris (1942). <sup>9</sup> Ayres and Ayres (1958). <sup>10</sup> Mackoff and Dahl (1951).

TABLE II

Botanical Name	English Name	Family	
<i>Narcissus</i> sp.	Daffodil. Narcissus	Amaryllidaceae	Dermatitis occurs in those cutting and packing the flowers
<i>Tulipa</i> sp.	Tulip	Liliaceae	Mainly in bulb handlers
<i>Hyacinthus orientalis</i> <sup>1</sup>	Hyacinth	"	Bulb handlers
<i>Asparagus officinalis</i> <sup>2</sup>	Asparagus	"	Market gardeners. Canning workers
<i>Daucus carota</i> <sup>3,4</sup>	Carrot	Umbelliferae	Canning workers
<i>Apium dulce</i> <sup>5</sup>	Celery	"	Market gardeners
<i>Humulus lupulus</i> <sup>6</sup>	Hop	Urticaceae	Hop pickets
<i>Pinus sylvestris</i>	Scots pine	Pinaceae	Foresters
<i>Ulmus campestris</i> and <i>montana</i>	Elm	"	"
<i>Citrus</i> sp.	Orange. Lemon. Grapefruit	Rutaceae	Fruit, but not stems or leaves, may cause dermatitis

<sup>1</sup> Johnson (1935). <sup>2</sup> Sternthal (1925). <sup>3</sup> Klauder and Kimmich (1956). <sup>4</sup> Vickers (1941). <sup>5</sup> Henry (1933). <sup>6</sup> Cookson and Lawton (1953). <sup>7</sup> Genner and Bonnevill (1938).

TABLE III.—*Plants Causing Phytophotodermatitis*

Botanical Name	English Name	Family	
<i>Achillea millefolium</i>	Milfoil.	Compositae	Very common wild plant
<i>Anthemis cotula</i>	Yarrow	"	Weed of arable and waste land. South and Central England
	Stinking mayweed	"	Abundant hedgerow plant
<i>Anthriscus sylvestris</i>	Cow parsley	Umbelliferae	
<i>Pastinaca sativa</i>	Parsnip	"	Roadsides, waste places
<i>Heracleum mantegazzianum</i>	Giant hogweed	"	Very tall. Introduced. Naturalized in waste places

### Clinical Features

#### Sensitization Dermatitis

The antigenic substances of plants are capable of producing the whole range of reactions of contact dermatitis from any other cause, domestic or industrial. It is rarely possible, on the morphological features alone, to suspect the primula in the parlour rather than the epoxy resin in the workshop.

The exposed skin is most seriously and often exclusively involved. Irritation, redness, and swelling of the eyelids and orbital skin; patchy dermatitis, sometimes sharply circumscribed, of the fingers and hands; acute or chronic dermatitis of face, neck, hands, and arms, are among the more common reactions. A careful and detailed history is essential. Seasonal incidence may be suggestive. Occupational exposure is rarely overlooked, as the worker often suspects the origin of his dermatitis, unless he dismisses and fails to mention the offending plant "because I've handled it for years and it has never caused me any trouble." Contact with house or greenhouse plants may be unwittingly concealed for the same inadequate reason, or because "everyone knows it does not cause dermatitis." In cases of extreme sensitivity the briefest and most casual contact with the plant, as, for example, on visiting a friend's house, may provoke a severe attack. Certain patterns of dermatitis are associated often enough with particular plants to be of diagnostic value.

**Bulb Fingers.**—Tingling, tenderness, and redness of the finger-tips develops, in those already sensitized, some 12 to 24 hours after the bulbs are handled. With repeated exposure the finger-tips become hyperkeratotic and fissured, or dry, scaly, and irritable. Tulip bulbs (Bertwistle, 1935) are frequently and hyacinth bulbs (Johnson, 1935) occasionally responsible. Similar changes confined to the fingers of one hand can be produced by onion and garlic "bulbs" in cooks (Burks, 1954).

**Lily Rash.**—An intensely irritable papular rash of the hands and forearms, sometimes spreading to the neck, develops in some persons engaged in cutting, bunching, and packing narcissi (Palmer, 1934; Stryker, 1936).

**Citrus Dermatitis.**—The common citrus fruits can cause a vesicular dermatitis in those engaged in peeling and preparing them. The dermatitis is usually confined to the fingers and hands, but, if exposure is continued, may spread to the arms and face. The peel is usually responsible, but some patients react to contact with the juice (Beerman *et al.*, 1938). The sensitivity may be specific for orange or for lemon, or the patient may react to both (Janson, 1953).

**American Ragweed Dermatitis.**—The inclusion of *Ambrosia* (American ragweed) and two related genera in Table I in a list of plants causing dermatitis in Britain

is open to objection, but is probably justifiable. Direct contact with the leaves and stems of these plants can cause a simple eczematous dermatitis, but of far greater importance is persistent seasonal dermatitis of all exposed skin provoked by the presence of the same antigenic substances in the pollen, which can be wind-borne (Brunsting and Williams, 1936). All these plants are now reported in Britain, and *Xanthium* in particular is extending its range. Although we know of no record of these pollens in British analyses the pollens of other Compositae of related genera are found (Hyde, 1959). It seems probable, therefore, that these species are actual or potential causes of dermatitis in Britain. These plants can also cause hay-fever, but the antigen concerned is an albuminoid substance independent of the oleoresins causing dermatitis.

#### Phytophotodermatitis

The clinical features of phytophotodermatitis are suggested by the alternative name, dermatitis bullosa striata pratense. The lesions consist of bullae which are often striate or irregularly linear in shape, sometimes forming a network corresponding to the points of contact between leaves and stem and the skin. They develop 12 to 24 hours after the plants have been crushed on the skin, which has then been exposed to sunlight. If the skin is moist the photodynamic effect is enhanced. Children playing in damp herbage or bathers on river banks are most often affected. Multiple lesions in troops on manoeuvres have aroused suspicions of mustard-gas burns. Agricultural workers lifting and topping parsnips in sunny weather may develop extensive lesions of the hands and forearms. The bullae soon heal, leaving pigmentation which may persist for many months.

### Diagnosis

#### Sensitization Dermatitis

Even when the circumstantial evidence seems conclusive the presence of sensitivity to the suspected plant should be confirmed by patch-testing. It is otherwise surprisingly easy for the wrong plant to be incriminated. If the plant responsible is quite unknown the patient should be asked to bring a list of the plants to which he is exposed, or, if this is beyond his powers, to bring specimens of the actual plants. The number of suspects may sometimes be too large for this to be practicable, in which case a personal visit to the nursery may be invaluable. The object should be to compile the fullest possible list of all plants, including, of course, those that the patient would call "weeds" and be therefore inclined to overlook. The plants selected for the first set of patch tests will be those known to be capable of causing dermatitis or others belonging to the same families. If the first tests are negative, tests with the remaining plants should be carried out. In some instances prolonged and repeated search may be required before the offending plant is identified; but the effort is well rewarded, as the diagnosis "dermatitis by plant or plants unknown" is of no practical value to the patient.

The technique of patch-testing is too well known to require description, but a few special points may be emphasized. In general a 1-cm. square of leaf is suitable, except in the case of bulb dermatitis, where a thin slice of the bulb or a single inner scale should be employed. The leaf should be selected from a strongly growing plant, and, if a cultivated plant is concerned, from the same horticultural variety as was

handled by the patient. There is some evidence that sensitivity to tulips and daffodils can at times be specific to one variety. Care must be taken to ensure that the plant concerned has no primary irritant effect on the skin. With the exception of the peel of the citrus fruits, which provokes a more severe reaction in some persons, the plants listed in Tables I and II rarely provoke more than slight erythema in non-sensitized individuals. Where plants whose irritant properties are unknown are employed for testing, control tests must be applied to normal persons. Patch tests must, of course, be postponed until the dermatitis has healed, and should always be applied to skin which has not been involved in the attack. The interscapular region is often suitable. The patches are removed after 48 hours and the tests are read then and again 48 hours later. A brisk eczematous response can be regarded as indicating allergic sensitivity; the evaluation of weaker responses requires care and experience.

#### Phytophotodermatitis

The diagnosis of phytophotodermatitis is usually simple. A bullous reaction to insect-bites is not uncommon on children's legs, but the tense hemispherical bullae, solitary or irregularly distributed, are quite unlike the pattern of linear bullae of phytophotodermatitis. Patch tests provide no useful information.

#### Treatment

Sensitization dermatitis is treated along the same lines as any eczematous reaction, with rest, sedation, and bland applications. In general the prevention of further attacks depends on avoidance of contact with the plant responsible, hence the importance of its identification. Desensitization has been attempted for a number of species, and promising progress is being made, but the results are at present uncertain. The patient whose livelihood depends on his handling the plant to which he is sensitive should be referred to a dermatologist, who can advise on the practicability of desensitization, although this is unfortunately seldom successful.

Phytophotodermatitis should be treated symptomatically by opening the blisters and applying an antibiotic ointment to prevent secondary infection.

#### Summary

The influence of changes in horticultural fashions and of the introduction and spread of foreign "weeds" on the patterns and incidence of plant dermatitis is summarized.

The varieties of plant dermatitis and their pathogenesis are described.

The nature of the antigenic substances in plants is discussed and the relationship between certain botanical features and capacity to induce dermatitis is emphasized.

The common causes of plant dermatitis in Britain are tabulated and clinical features, diagnosis, and treatment are reviewed.

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## EFFECT OF SUXAMETHONIUM ON CARDIAC RHYTHM

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Suxamethonium (succinylcholine) has been known to produce a bradycardia in infants and young children (Leigh *et al.*, 1957; Telford and Keats, 1957). Martin (1958) and Bullough (1959) have reported that repeated doses of suxamethonium caused not only a slowing of heart rate but also a disturbance of rhythm. It seemed important to confirm these findings, and to find out in greater detail whether this relaxant drug could cause—in clinical practice—a disturbance of rhythm sufficient to produce a circulatory collapse.

#### Method

An unselected group of 41 patients (31 females and 10 males) whose ages varied from 18 to 62 years, were given repeated doses of suxamethonium varying from 10 to 100 mg. and the effect upon the heart rate was recorded by an electrocardiograph. The first 36 patients of this series were premedicated with papaveretum 10 mg. and hyoscine 0.4 mg., while for the last five patients atropine 0.6 mg. was substituted for the hyoscine. Anaesthesia was induced with thiopentone and maintained with nitrous oxide (6 litres) and oxygen (2 litres) on a circle system, incorporating fresh soda-lime, via a facepiece. Additional doses of thiopentone and a single dose of pethidine (15–30 mg.) were given whenever necessary to maintain an even level of light anaesthesia. During the periods of paralysis controlled respiration with mild hyperventilation was employed. The electrocardiographic recordings were made with the standard lead II circuit (right arm and left leg) and all tracings completed before the operation was begun.